

Riding the wave of the High Energy Blast Facility (HEBF)

By **Cheerie R. Patneau**

Imagine telling someone that your day job is blowing things up. Those who work at White Sands Test Facility's High Energy Blast Facility (WSTF HEBF) have clocked in at work to do large-scale liquid and solid propellant explosions since 1991.

The facility was built in 1991 when the United States Air Force (USAF) requested that WSTF conduct explosions of rocket propellants used by the Space Shuttle as well as several other U.S. and Japanese launch vehicles. The new data would allow better estimation of the blast effects if a launch vehicle were to fail only a few seconds after launch. Engineers needed to know the minimum safe distance to place personnel and critical equipment, just in case this disaster should occur and large parts of an almost fully fueled vehicle fall into the launch complex.

The WSTF HEBF is highlighted by the capability to record up to 100 channels of pressure data at rates of 1 million samples per second, characterizing near and far-field effects of a blast which is typically over in less than a quarter of a second. Since 1991, approximately 40 liquid propellant tests with six different propellant combinations have been completed. These tests have shown an interesting relationship, or lack thereof, between liquid propellant explosions and those produced by other common explosives such as Trinitrotoluene (TNT).

"Liquid propellant explosions cannot be adequately described by TNT, as is currently the practice," said NASA Project Manager and Facility Manager for the HEBF Radel Bunker-Farrah.

"The explosion produced by liquid propellants is very dependent on the extent of mixing between the propellants and the time from mixing to ignition."

The team is currently finalizing their conclusions from the nine years of liquid propellant explosion testing and is writing a test report they intend to publish. The report also contains recommendations for new standards evaluating liquid-propellant explosions.

The HEBF test team consists of employees from NASA and Honeywell Technology Solutions Inc. at WSTF, as well as outside consultants. The team performs liquid and solid-propellant explosion studies for other NASA centers, the

USAF, and has worked internationally with the National Space Development Agency (NASDA) of Japan. The team received two group achievement awards for several NASA payloads, such as Galileo, Ulysses and Cassini, and the large-scale hypergolic, cryogenic and solid-propellant testing.

The HEBF test team is currently performing small-scale, solid-propellant tests. These tests are evaluating a break up system for a STAR 48 upper-stage, solid-rocket motor. Such rockets are typically used to deploy satellites into low-earth orbit. The objective of the system is to break up approximately two tons of solid propellant in the

dome of the STAR 48 motor. Previous solid-propellant tests were performed to support an investigation into the failure of an Air Force Titan 34D launcher.

Bunker-Farrah feels the HEBF team deserves credit for safely obtaining reams of data on these inherently hazardous tests for more than 10 years.

Members of the team include: Larry Starritt, Tony Carden, Barbara LaRue, Don Saunders, John Hanson, John Claffy, Dave Huskey, Randy Page, Lou Rosales, and Dave Hendon, all from HTSI; Marshall Eck of Foils Engineering and John Taylor of John W. Taylor Enterprises. ■



The High Energy Blast Team with NASDA and NASA Headquarters customers. Radel Bunker-Farrah is at top left. Bunker-Farrah is the Project Manager and Facility Manager for the HEBF.



The team studies free-air blast waves produced by liquid propellants.